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DONOHUE & ASSOCIATES, INC.

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REMEDIAL INVESTIGATION AND BASELINE RISK ASSESSMENT DRAFT REPORT

REVIEW COMMENT REPORT RI/FS OVERSIGHT

FOR

HI-MILL MANUFACTURING SITE
HIGHLAND, MICHIGAN

August 3, 1990

DONOHUE REVIEW

RI REVIEW COMMENT REPORT

GENERAL COMMENTS

This report provides review comments on the Remedial Investigation and Baseline Risk Assessment Draft Report (RI report) prepared by Techna Corporation (the authors) for Hi-Mill Manufacturing Company (PRP). The purpose of the review is to determine whether the RI report conforms to requirements and guidelines set forth by U.S. EPA, and to evaluate the completeness and technical adequacy of the RI report.

The format of the RI report follows the suggested outline in the EPA guidance document "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Interim Final, October 1988."

The RI obtained a large amount of data to evaluate the areal and vertical extent of contamination at the site. The RI report address the contamination at the site by types of environmental media. It also recommends collecting a limited amount of additional data to better characterize the extent of VOC contamination in the shallow groundwater system. The comments in this section are intended to point out critical issues concerning the quality and accuracy of the RI report.

Data Completeness and Evaluation

In general, this report does not show the interrelationship between the RI and feasibility study as discussed in the cited guidance document. Important goals of an RI generally include: 1) to characterize the horizontal and vertical extent of contamination, 2) to evaluate risk, and 3) to obtain data needed to evaluate remedial alternatives, including the no action alternative. This RI report does addresses the first two goals. However, we cannot assess whether the third goal was met because preliminary identification of remedial alternatives, the associated data needs, and data quality objectives for evaluating those alternatives are not discussed in the RI report. The report should present potential remedial alternatives and discuss whether the author's believe that sufficient data have been collected during the RI to allow evaluation of those alternatives. Furthermore, if treatability studies are required to further evaluate alternatives, the need for these treatability studies should be identified in the RI report.

Usually, the question of whether sufficient data have been obtained to meet the stated goals is addressed in the data completeness and sufficiency section of the RI report. This draft report discusses only about data completeness by comparing the amount of data collected to that proposed in the work plan. It does not address whether the data are sufficient to meet the goals of the RI. The amount of data collected during the RI, together with limited additional data acquisition activities, might well be sufficient to meet all of the typical goals of an RI. However, with the presentation and discussion of the data which are provided in the RI report, we cannot conclude that this is the case.

Typically, RI's more closely follow the planning and procedural recommendations in the referenced guidance document, particularly six key elements:

1. Preparation of the conceptual site model to identify the general contaminant sources, transport pathways, and receptors.

2. Identification of the decision types and data users, including risk assessors and feasibility study engineers.

3. Identification of data uses including completion of the risk assessment and evaluation of remedial alternatives.

4. Identification of preliminary remedial objectives, potential ARARS (preliminary), and potential remedial alternatives.

5. Identification of data needs to satisfy the data uses.

6. Identification of data quality objectives to be sure that the quality assurance objectives are adequate to meet the data user requirements.

Without a discussion of these elements, it is not possible to determine whether sufficient data have been obtained during the RI to meet all the goals and to meet the data quality objectives.

We recommend that the six elements be discussed in the final report along with an assessment of whether sufficient data are available to proceed with the remaining elements of the feasibility study. Chapters 1 and 2 of the cited guidance document provide a more detailed discussion of the reasons for addressing the interrelationship of the RI and FS.

Data Presentation

The data are presented in a format that makes it difficult and time consuming to determine whether the data support the technical conclusions. For example, the text discusses contamination as a function of depth in soils; however, there is no figure to illustrate this and no table that shows the data in a spatial relationship. A second example is the presentation of geology and hydrogeology information. A critical point is made that barriers to vertical contaminant migration exist at the site; however, there is only one generalized cross-section presented. The site conditions should be presented in more detailed cross-sections carefully depicting heterogeneities within the defined hydrogeologic units. The location of monitoring wells should be shown on the cross-sections emphasizing the position of well screen intervals within the hydrogeologic units. Such a graphical representation would more clearly show the units being monitored and would aid in groundwater flow interpretations. In addition, the figures presented are generally difficult to read and their locations in the should be referenced in the table of contents.

Ecological Assessment Data Needs

The ecological assessment underscored the fact that significant data gaps exist which prevent a valid assessment of whether the contaminant levels pose an actual or potential threat to the wetland ecosystem (especially in the sediments). Additional biotic sampling, of both flora and fauna, of the Target Pond and control areas should be performed and comparisons made. Indeed, the possible need for further sampling was explicitly recognized by the authors in the context of metal uptake by plants (p.147 in the RI report), and in the following statement in the work plan (p.37 of 40 in the work plan). "If the results of the water and sediment sampling and analysis activities in the marsh/pond southeast of the site indicate that contamination is present at levels that could be harmful to aquatic systems, then an additional biota study may be necessary to evaluate the potential impairment and any causal factors". This additional sampling should be considered essential to an adequate assessment of the ecological impacts of the sediment contaminants to the wetland ecosystem and should be conducted.

SPECIFIC COMMENTS

1. Page 1, Section 1.1 - Donohue recommends that the authors discuss the data needs and data quality objectives associated with the evaluation of remedial alternatives and assess whether sufficient data were collected during the RI to allow evaluation of alternatives and completion of the feasibility study.

2. Page 17, Section 2.1 - The EPA contractor is Donohue, not "GZA/Donahue."

3. Page 18, Section 2.1.2 - In the "purpose and scope" section, the purpose for collecting the surface water and sediment samples is not stated. Were the samples collected only for site characterization purposes and risk assessment or were some of the samples collected to allow evaluation of remedial alternatives? It is important to address this question to assess whether sufficient data are available to complete the FS.

4. Page 21, Section 2.1.3 - The "purpose and scope" section for the soil investigation does not state the purpose for collecting these samples. The authors should summarize the purpose and in particular, state whether any of these samples were collected to allow evaluation of alternatives in the feasibility study and whether data quality objectives were set or met.

5. Page 22, first paragraph - Soil sample locations are shown on Figures 2-1, 2-2, and 2-3, not just Figures 2-2 and 2-3. In Paragraph 6, second sentence, the text states that samples from Area 2 are designated with the sample notation OG. We believe this sentence is discussing samples from Area 4.

6. Page 26, Section 2.1.4 - Once again, in the "purpose and scope" section for the soils investigation/physical characteristics, the scope is discussed but the purpose is not addressed at all.

7. Page 29, Section 2.1.5 - The purpose of the groundwater investigation is clearly stated in the first paragraph. An additional purpose of this investigation should be to obtain data for evaluation of remedial alternatives. This purpose should be stated.

8. Page 33, Section 2.1.6 - Slug tests were performed on select wells. The rationale for selecting the tested wells should be explained in the report text. Do the chosen wells adequately characterize the site aquifers?

9. Page 34, Section 2.2 - The technical memorandum on data completeness appears to address only whether the samples identified in the work plan have been completed. The memorandum does not address whether the samples collected provide sufficient data to meet the objectives of the RI. The RI objectives should:

   - include characterization of the contaminants and the vertical and horizontal extent of contamination;
   - provide sufficient data for the risk assessment; and
   - provide sufficient data to assess remedial alternatives.

10. Page 37, Section 3.2 - Locations of staff gauges are shown on Figure 2-4. How do the staff gauges labeled SG-3 and SG-4 correspond to Table 3-1? The authors should clarify this so that tables can be integrated with figures when interpreting water elevation data and potentiometric surfaces.

11. Page 37, Section 3.2, fifth paragraph - field observation does not indicate a direct connection between the Target Pond and the shallow wetland north of M-59. Do the authors mean to imply that these features are not connected with respect to both surface water and groundwater? Possible groundwater interaction between the features should be discussed.

(Note: The authors seem to use the terms "Target Wetland" and "Target Pond" interchangeably. We have used "Target Pond" in our comments as shown on the figures. The terms should be explained and used consistently both in the text and on the figures.)

12. Page 43, Section 3.2 - The Target Pond and Waterbury Lake are explained as exposed groundwater surfaces. Another explanation could be perched groundwater conditions. The authors should discuss this possibility and provide their reasoning for accepting or discounting it. It was stated that borings SW-13 and SW-16 did not encounter a shallow saturated zone. It is not clear where these borings were located. The potential for contaminant migration is dependent on accurate definition of saturated/nonsaturated conditions and on possible isolation of perched groundwater. The lack of a shallow saturated zone at these locations needs to be further explained and related to the occurrence of the groundwater surface across the site.

13. Page 43, Section 3.3 - Geology: Lateral discontinuities are commonly present in the types of glacial deposits described. One cross-section across the site is inadequate to formulate an accurate representation of a complex geologic environment. Lenses and heterogeneities are not accurately defined in the RI report, yet these may prove crucial to defining the groundwater flow system within the six units later defined. Given the presentation of the data, Donohue is unable to evaluate whether specific geologic units can adequately act as barriers to contaminant movement.

14. Page 48, Section 3.5 - Hydrogeology: According to the RI report, Slug test data from SW-9A indicates a horizontal hydraulic conductivity of 2.25 x 10^{-3} cm/sec but groundwater flow velocities have not been calculated for the shallow groundwater system. Given the importance the authors place on this unit with regard to contaminant occurrence, velocity calculations are important and should be added. The authors should also justify the appropriateness of using the hydraulic conductivity obtained from SW-9A as representative of the entire hydrogeologic unit.

15. Page 48, Section 3.5 - First paragraph: Terms used to describe deposits are inconsistent. For example, both "unit" and "zone" and "hydrologic Unit I and "hydrogeologic I" are used although the section is titled "Hydrologic I" are used although the section is titled "Hydrogeologic units" one term should be chosen and used consistently throughout the discussion. Assessment of Hydrogeologic Unit II as an effective barrier to vertical migration may or may not be accurate. Based on cross-sections, and the accompanying descriptions, more information is needed to qualify lateral continuity, thickness, etc. Are thin silt or silty sand interbeds continuous enough to provide preferential pathways for groundwater flow? Given that lab permeabilities tend to underestimate field data by as much as two orders of magnitude and that only two lab permeabilities are used to characterize this unit, the authors should justify in more detail the assumption that this unit acts as a barrier.

16. Page 48, Section 3.5 - Hydrogeologic Zone IV varies from 20 feet thick at DW-2 to only 1-foot thick at DW-1 - a distance of approximately 500 feet. It is Donohue's opinion that the data may be interpreted as a lens within similar material comprising Zone III and V instead of as a distinct unit. This consideration and its implications to whether Zone IV is an effective barrier to contaminant migration should be discussed.

17. Page 49, Section 3.5 - Hydraulic Potential: No reason is given for inconsistent water level fluctuations between shallow wells. The authors should reassess and discuss the appropriateness of each shallow well for inclusion in the potentiometric surface map. Is the same potentiometric surface being measured in each case? One might expect SW-17 screened at 35 feet to display different fluctuations than SW-10 screened at 4.5 feet. This has important implications to interpretation of shallow groundwater flow direction, and subsequently, to contaminant movement within the shallow groundwater system.

18. Page 49, Section 3.5, Figure 3-3 - The authors need to reevaluate which wells should be used to construct Figure 3-3. Contouring programs are objective and cannot interpret and weigh other factors which may influence the expression of the potentiometric surface (e.g., topography, stratigraphy, etc.). These factors should be evaluated in order to support the interpretation and this evaluation should be presented in the text.

19. Page 51, Section 3.5, 1st paragraph, Mounding near SW-12 - Is there a possible correlation of perched water associated with the higher elevation of the clay in that area? The authors should evaluate this and discuss it in the text.

20. Page 51, Section 3.5 - Based on the data as presented in Figure 3.3, it is difficult for Donohue to concur with the stated groundwater flow direction. A generalization of the flow direction for the shallow unit (i.e., generally south) is inadequate. Rather, a more complex, localized flow, in which the surface water bodies are an integral part, should be discussed.

In addition, on Figure 3-4., the elevation of IW-5 (990.03) cannot be ignored. Donohue contends that flow should radiate to the west, southwest, and south including based including on this elevation in the interpretation.

With regard to Figure 3-5, the groundwater flow direction within the deep aquifer is ambiguous because the contours are not labeled (or are unreadable).

21. Page 51, Section 3.5 - Figures 3-3, 3-4, and 3-5 - A graphical rendering or cross-section of wells which shows their screened positions within the defined hydrogeological units would aid in flow/potentiometric surface discussions.

22. Page 51, Section 3.5 - Potentiometric surface discussion should be consistent with the defined hydrogeologic units and the shallow, intermediate, or deep aquifers. Some of the shallow wells are likely monitoring the intermediate aquifer, and potentiometric surfaces should be contoured accordingly.

23. Page 51, Section 3.5 - $V = KI/n$, what value was used for porosity in the groundwater velocity calculations, and why?

24. Page 51 and 54 - Calculated vertical gradients would be more meaningful than simply listing the groundwater elevations with depth in assessing predominance of vertical versus horizontal groundwater flow. In order to demonstrate that there are barriers to vertical flow, we also recommend that vertical flow velocities be calculated. (This also requires that vertical gradients be calculated.)

25. Page 56 - The discussion of the background soil concentration of metals refers to Table 4-1. The numbers summarized in the text are not consistent with the numbers shown in the table. For example, the mean copper background concentration is 4.3 milligrams per kilogram in the text and 3.57 in the table. There are also inconsistencies for all of the other metals reported in that table. The text should be corrected. The authors should reevaluate whether conclusions drawn concerning the background concentrations are still valid.

26. Page 66 and Table 4-3 - Table 4-3 lists data for the background samples that were deleted earlier as being not representative of site background conditions. Should these values be in this table? Were they included in the site background averages and if so, how does this affect the interpretation of the background data compared with the remainder of the site data?

27. Page 66, Section 4.1.2 - In this section and in other sections of data interpretation, it appears that only data without flagged data qualifiers are being considered or that data without qualifiers are given more credibility than data with qualifiers. Qualified data should not necessarily be dismissed or necessarily be considered less useful than

nonqualified data. These flags are meant to alert the data user to important information concerning the analysis; not to imply that the data should not be used. This is especially true of the J qualifier which indicates that the value is an estimated value. A high concentration reported for a sample should be a matter of concern even if the J qualifier appears.

If data are to be dismissed or considered of lower quality based on certain qualifier flags, a discussion of data quality objectives relating data use to the data quality should be presented in this report including justification for specific data to be dismissed.

28. Table 4-3 - Donohue calculated the mean concentration for cobalt to be 3.01 milligrams per kilogram compared with the 2.66 reported in the table. All calculated values in the table should be rechecked.

29. Page 73 and Tables 4-6 and 4-7 - Values for aluminum in the groundwater are reported under both the shortlist metals and the TAL inorganics. In the case of the shortlist metals, the concentration is listed as a maximum of 648 micrograms per liter. Under the TAL inorganics, the maximum concentration is listed as 208 micrograms per liter. Why are these maximum values different? What significance does the difference have to the overall conclusions concerning aluminum in the groundwater? The use of these two data sets and whether the values can be compared should be discussed in the RI report.

30. Page 82, Section 4.4.1 - The RI report indicates that the concentration of elevated metals in the soils between the production facility and the Target Pond are roughly bounded by the sample grid but the extent of contamination has not been fully defined. Is it the authors opinion that sufficient data have been obtained to sufficiently characterize the area of contamination and meet other objectives or is further definition of this area required to meet the goals of this investigation?

31. Page 82 - The report implies that the extent of contamination indicated by the sheer number of results above background for aluminum, chromium, copper, nickel, and zinc may be overstated because the relative concentration for many of these samples were not significantly above background. This statement may be true, but the conclusion should be drawn based on the results of a risk assessment. Also, the report indicates that there may be a negative bias in the background concentrations because all naturally occurring soil types may not have been sampled. This may be true, however, it may also be interpreted that there could be a positive bias for the same reason. These issues should be evaluated and discussed in the text.

32. Page 82, last paragraph - The report indicates that the highest levels of contamination were generally found above the soil-clay interface. This is an extremely important point and it should be illustrated by a figure showing the distribution with depth or at least by a table where the shallow and deeper samples are clearly identified in separate table sections.

33. Page 83, grid area VWXYZ-012 - The report once again indicates that the highest levels of contamination were generally found above the soil-clay interface. This should be shown clearly in a data table that separates the data by soil depths or, preferably, in a figure that shows the concentration with depth.

34. Page 83 - Toluene was dismissed as a contaminant of potential concern because it was found in only a few soil samples without the data being flagged with data quality qualifier codes. As discussed earlier, data should not be dismissed simply because there are qualifier codes. An explanation is needed concerning the reason for dismissing the data based on the qualifier codes.

35. Page 83, grid area RST-01234 - Again it is stated that the clay layer appears to be a barrier to downward migration of metals. This is an extremely important point that may be supported by the data; however, the data are not presented in a way that allows this comparison to be made. This can be accomplished by presenting the data in a table that breaks out the data by depth or preferably in a figure that graphically shows the concentration with depth.

36. Page 84, Section 4.4.2 Groundwater - A conclusion drawn in the groundwater section is that contamination is limited primarily to the upper saturated zone. The report suggests that this is demonstrated by the data and is consistent with the observations that there are low permeability geologic units that are continuous across the site and retard the downward flow of both groundwater and contaminants. This extremely important conclusion could well be true, however, more justification is required to demonstrate that the conclusion is reasonable. First, more justification must be provided for eliminating some of the volatile organic data. Dismissing data because the compounds are common laboratory artifacts and because they have chemical flags is not sufficient without further discussion of the specific data. Second, the report suggests that there are three distinct aquifer zones which are called the shallow, intermediate, and deep aquifer zones. The geologic information as presented is insufficient to allow the conclusion that the confining geological barriers have sufficient continuity to provide a site-wide barrier to the downward migration of contaminants. If these aquifer zones are indeed essentially isolated, one would expect that the overall water chemistry of each zone would be different.

Donohue suggests that the authors analyze each zone for major cations and major anions to determine if these in fact are distinct hydrogeologic units. Samples from wells in each unit could be analyzed for calcium, magnesium, sodium, potassium, chloride, sulfate, and biocarbonate (through an alkalinity analysis) to determine the water type. In addition, isotope analysis, for example tritium, might be helpful in demonstrating that the waters are different. These analyses are relatively inexpensive and sometimes provide a great deal of information for defining distinct groundwater units.

37. Page 86, last paragraph - The report concludes that there is rapid attenuation of metal contaminants in the sediments with depth. We recommend that the importance of metals in the biologically active zone of the sediments and the potential for cycling of the contaminants back into the bulk water phase be discussed. Assessing whether sensitive organisms in the wetland have been affected by metals toxicity or conducting monitoring of the water phase during each season to determine whether metals are being cycled back to the water phase may be needed in order to deal with this technically complicated issue.

38. Page 88, Section 5.0, Contaminant Fate and Transport - The contaminant fate and transport section is primarily a qualitative discussion of the chemical and physical mechanisms that control the transport and persistence of contaminants in the environment. The discussion is useful; however, a more quantitative assessment is needed to complete the risk assessment and to assess remedial action alternatives. For example, the expected concentrations at identified points of exposure must be determined. Quantitative methods for determining exposure point concentrations range from simple to complex. A brief justification for the method selected to prepare the quantitative evaluation should be provided. Information concerning methods for completing such an assessment can be found in the EPA guidance document: "Determining Soil Response Action Levels Based on Potential Contaminant Migration to Groundwater: A Compendium of Examples, EPA/540/2-89/057."

39. Section 6.5 throughout - There are two general types of problems with the logic employed in the ecological risk assessment as presented. First, the text contains a number conclusions that do not logically follow from the evidence presented. Secondly, in some instances the evidence presented just as well supports conclusions that are opposite to those drawn by the authors. Consequently, the ecological assessment does not meet the scope established in the work plan, nor the objectives identified in Sections 6.5.1 and 6.5.2 of the draft RI report. This is especially true with respect to assessing the potential threats to the wetland ecosystem and the causal relationships that may be involved. The next four comments provide specific examples of these problems.

40. Section 6.5.5, page 147 - The authors point out that, in general, the majority of research reported in the literature on bioaccumulation of contaminants has focused on organic, lipid-soluble compounds in body fat and hepatic and pancreatic tissues. The authors therefore conclude that a discussion of food-chain enhancement is irrelevant to the Hi-Mill investigation. The fact that past research has focused on contaminants not of concern at the Hi-Mill site makes the research information irrelevant; it does not make a discussion of food-chain enhancement of metals at the site irrelevant. Bioaccumulation of metals could be a reason why the biological diversity in the marsh sediments is low.

41. Section 6.5.5, page 147 - The authors dismiss the threat of heavy metals to higher trophic levels by stating that heavy metals do not biomagnify in food chains. Biomagnification is not a necessary condition for contaminants to pose a potential threat. In addition, by combining discussions of bioaccumulation and biomagnification in the same paragraph, the authors seemingly imply that bioaccumulation and biomagnification are the same phenomenon; they are not.

42. Section 6.5.6, page 147 - The authors state that, "Due to the obvious dearth of both diversity and the numbers of individuals per species represented, the risks associated with the heavy metal contaminants [in the sediments] are probably minimal." The opposite conclusion could as easily be drawn, namely that the heavy metals are causing the low diversity and are therefore a significant concern. This seems a more plausible conclusion than the one presented by the authors given the fact that the only benthic macroinvertebrates found were midges, which, as pointed out by the authors and in the MDNR study, are known to be pollution tolerant.

43. Section 6.5.6, page 148. The authors point out that most toxicological information available is provided in the context of human health concerns and that they only located information which addressed surface waters and not sediments. The authors then point out that the contaminant concentrations in the water column in the Target Pond are below the ambient water quality criteria they located. From this, the conclusion is drawn that "the contaminants of concern are not a threat to the wetland ecosystem." However, this completely ignores the fact that the concentrations of the metal contaminants in the sediments are three orders of magnitude greater than in the water column. The mere fact that criteria could not be identified, against which the sediment concentrations could be compared, does not mean these contaminants do not pose a threat to the ecosystem.

ARCS/R/HIMILL/AA2

Hi-Mill RI/FS Oversight
Review Comment Report

August 1990

LIFE SYSTEMS REVIEW

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ENDANGERMENT ASSESSMENT REVIEW COMMENT REPORT

RI/FS Oversight for the Hi-Mill Manufacturing
Company Site

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LIST OF ACRONYMS

ATSDR	Agency for Toxic Substances and Disease Registry
BC	Background Criteria
BRA	Baseline Risk Assessment
CDI	Chronic Daily Intake
EA	Endangerment Assessment
FS	Feasibility Study
HSDB	Hazardous Substance Data Base
HQ	Hazard Quotient
IRIS	Integrated Risk Information Service
MCL	Maximum Contaminant Level
MRL	Minimum Risk Level
PbB	Blood Lead Level
RfD	Reference Dose
RI	Remedial Investigation
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

1.0 INTRODUCTION

This report provides review comments on the Draft Endangerment Assessment (EA) prepared for the Hi-Mill Manufacturing Company by Techna Corporation (1990). The EA addresses potential risks to both human health and the environment under the baseline (i.e., no remedial action) conditions at this site.

The purpose of this review is to determine whether the EA conforms to the requirements and guidelines set forth by the U.S. Environmental Protection Agency (EPA) in the following guidance:

- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A, Human Health Evaluation Manual and Volume II Environmental Evaluation Manual (USEPA 1989b,c).
- The Exposure Factors Handbook (USEPA 1989a).
- The Superfund Exposure Assessment Manual (USEPA 1988).

In addition to this Introduction, this report includes five other sections. Section 2.0 provides an overview of the adequacy and technical accuracy of the EA. Section 3.0 provides specific review comments on the human health baseline risk assessment keyed to individual sections or pages of the EA. Section 4.0 provides specific review comments on the environmental assessment; Section 5.0 provides additional comments on the Remedial Investigation (RI) related to risk assessment issues, and Section 6.0 provides citations for references used in preparation of this report.

2.0 OVERVIEW - GENERAL COMMENTS

The guidance for performing risk assessments at Superfund sites also provides guidelines for reviewing a risk assessment report (USEPA 1989b). The comments in this section are organized according to a reviewer checklist provided in Exhibit 9-2 (USEPA 1989b) and are intended to point out critical issues concerning the quality and accuracy of the risk assessment.

General Concerns

Guidance (USEPA 1989b) suggests that a summary (including the complete risk characterization section) of the BRA be included as a chapter in the RI. The full report then becomes an appendix to the RI.

The introductory section of the Hi-Mill risk assessment did an inadequate job of explaining the objective of the report, the scope, site history and providing a general map of the site. Some of this information was presented elsewhere (i.e., in the RI) but needs to be summarized in relationship to the risk assessment. The lack of a good site map, with all identifying features and relationships to potentially exposed populations made the risk assessment review difficult.

Data Collection and Evaluation Concerns

The EA does not adequately document the data evaluation process. Summary tables indicating frequency of detection, range of detection limits and detected values were not prepared for every chemical in each sampled medium. This makes it difficult to verify conclusions reached. It does appear, however, that the inorganic chemicals selected as site related are reasonable; rationales for exclusion of organic chemicals need further documentation. The exclusion of organic chemicals based on their qualifiers is troublesome. It is not apparent what organics have been eliminated. Very low concentrations of organic carcinogens can contribute significantly to unacceptable risk depending on the exposure pathway being quantified. The issue of data quality control was not addressed. The inclusion of a data evaluation chapter describing relevant data quality issues and sampling results is, therefore, recommended.

Exposure Assessment Concerns

There was no site conceptual model provided either in the RI or in the EA.

Although the qualitative descriptions of exposure pathways appear adequate, the document contains major deficiencies in quantifying exposures. An upper bound of the mean sample concentrations was not calculated and it was difficult to verify what samples were used to calculate concentration values. Numerous errors were made in chronic daily intake calculations, both in the use of incorrect variables and frank mathematical miscalculations. More importantly, the concept of exposure occurring over three time periods (subchronic, chronic and lifetime) was not even acknowledged, much less addressed. Another disturbing omission is the fact that exposures involving children were not quantified where it appeared reasonable to do so.

A very careful quality control check is recommended after revision of this section both from a mathematical perspective and a careful review of whether correct input variables have been used.

Toxicity Assessment Concerns

The toxicity assessment is inadequate in its description of toxic effects of the chemicals of potential concern. At a minimum, each toxicity summary should explain the derivations of the toxicity values subsequently used in risk characterization. The Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles for these chemicals are an excellent source of this information. Toxicity values were extracted from the correct sources but some values were incorrectly used in subsequent calculations.

Risk Characterization Concerns

The risk characterization section integrates the output of the exposure assessment and the toxicity assessment. Until revisions are made in these two areas, the accuracy of the risk estimates cannot be verified. It is, however, apparent that the authors of this report are not familiar with the concepts of:

- Calculating a noncancer hazard quotient
- Summing hazard quotients to obtain a hazard index
- Combining risks across pathways for those exposures relevant to a given population

Uncertainty regarding site risk assessments is generally large. This report ignores uncertainty completely. A complete section addressing all categories of uncertainties applicable to this risk assessment must be incorporated into the next revision.

Environmental Assessment Concerns

The minimal environmental assessment presented in this EA does not meet guidance. It is apparent that no assessment was done, and the 1984 biological survey was used to draw conclusions. At a minimum a preliminary ecological assessment should be conducted to include:

- Coordination with the Federal and State Natural Resource Trustees to develop a preliminary resource survey
- Develop an ecological inventory for the site

The output could then be used in performing an ecological exposure assessment, ecotoxicological assessment and a risk and impact evaluation.

3.0 SPECIFIC REVIEW COMMENTS ON THE HUMAN HEALTH BASELINE RISK ASSESSMENT

1. Page 91. An additional objective of a Baseline Risk Assessment (BRA) is to provide justification of the need for remedial action at a site. Add this objective to the first paragraph on this page.

2. Page 92. Section 6.6 discussed in this introduction was not provided. This was to provide a summary of the findings of the BRA. The use of the results of the risk assessment in developing remedial action objectives (health-based cleanup goals) should be summarized in the Feasibility Study (FS).

3. Page 92. A site background summary should be included here, including a site map which details <u>all</u> important site characteristics and features.

4. Pages 93 through 113 should be reorganized in a separate section titled "Data Evaluation." Brief summaries of the data sampling activities should be repeated here. The objective of data evaluation is two fold: (1) to determine what chemicals detected are likely to be site related and should be the focus of the risk assessment and (2) to determine if the sampling data collected are of acceptable quality for use in the risk assessment.

5. Page 93. The following organization for data evaluation is suggested:

   X.X Data Collection and Evaluation

   X.X.X Summary of sample collection (Include location and analytical methods on a medium-by-medium basis. Present results either in summary tables or by reference to an appendix.)

   X.X.X Selection of Contaminants of Potential Concern (It is important to state the decision rule utilized in eliminating chemicals from the risk assessment.)

   - Elimination of chemicals based on comparison to background.
   - Elimination of chemicals based on frequency of detection.
   - Elimination of chemicals based on laboratory blank contamination.
   - Summary of selected contaminants of potential concern (Exhibit 5-7 in USEPA 1989b).

   X.X.X Data Quality Considerations (Discuss field and laboratory quality control. Define data qualifiers and how the qualifiers will be used in the risk assessment.)

6. Tables 6-1 through 6-3 provide information on eliminating chemicals from the risk assessment. The tables, however, include only those chemicals which were selected. No comment on the accuracy of contaminant selection can be made unless the frequency of detection, range of detection limits (U-values) and range of detected values are provided for all analytes.

   The text implies that the following elimination decisions were used for selecting contaminants of potential concern:

   - A metal whose sample concentrations were greater than the calculated background criteria (BC) in two or more soil samples was retained. Barium, calcium, iron, magnesium, potassium and vanadium all had more than three BC exceedances, yet were eliminated. Provide a rationale for eliminating these chemicals.

   - Infrequent detection (e.g., in one sample only) - thereby eliminating chlorobenzene and di-n-butylphthalate. We agree with this.

   - Toluene, methylene chloride, acetone and 2-butanone were eliminated as common laboratory contaminants. As long as the 10 x rule as described in USEPA (1989b) was correctly applied, we agree with eliminating these chemicals. Documentation of the level of blank contamination should be inserted in the text so the reader can readily conclude that these chemicals are not site related.

   - Xylene was eliminated with no rationale provided.

   - J-flagged chemicals (not identified) were eliminated because they were J-flagged. This is not recommended since J-flagged values are generally used in risk assessment as if they were unqualified. Because J-qualified data were not summarized, no conclusion can be drawn regarding whether other chemicals should have been included. Two chemicals, 1,1,2,2-tetrachloroethane and 1,1,2-trichloroethane, were mentioned as J-flagged chemicals and thus, were eliminated from the risk assessment. A more convincing rationale must be provided.

7. Page 93, Analysis of Background. The decision appears reasonable to exclude site impacted background samples from the calculation of site background. The calculation of background criteria are also reasonable, although USEPA (1989b) recommends using geometric rather than arithmetic means. The last sentence on page 93 should be revised so that it clearly states the decision rule and rationale for eliminating chemicals present in background.

8. Page 95. The values in this text do not match Table 4-1 and 4-2 in the RI. Once the inconsistency is resolved, the information could be more clearly presented in tabular format.

9. Page 95. Define the N flag for the reader. If spikes were out of control (usual N flag definition) were spike values high or low? A precision problem is mentioned with sample B1-0 but no conclusion made

regarding data acceptability. These are two items that should be mentioned when discussing data quality. Were these data validated, are they usable?

10. Page 96. Statements regarding exceedances above background cannot be verified without a data summary as suggested by Exhibit 5-6 in USEPA (1989b).

11. Page 100 to 101. Rationales must be provided for eliminating chemicals detected in groundwater from the risk assessment. No background comparisons were made. The decisions regarding selection of contaminants of potential concern are made on a medium by medium basis. Antimony at a level of 56 μg/L in the groundwater will result in a hazard index greater than 1.0 when a drinking water scenario is evaluated. Is this due to the site or background?

12. Page 102. Insert a description of where background samples were taken for surface water and sediment.

13. Page 103 and 106. Tables 6.3 and 6.4 summarize both background and site samples (sediment and surface water). They are, therefore, not useful for informing the reader what chemicals were detected above background. (See comment 10 regarding summary tables.) No rationales are presented for selecting chemicals of potential concern in these media. The correct units on Table 6.4 should be mg/kg.

14. Page 105. Define the qualifier "AC."

15. Page 107. The last sentence in the paragraph describing zinc implies BC values were calculated for sediment. If so, please describe the derivation of the BC values quoted in this section.

16. Page 109. Correct Pd to Pb in the first sentence.

17. Page 114. It would be better to discuss possible exposures on a pathway element basis i.e., (1) sources, (2) release mechanisms, (3) exposure points, (4) exposure routes and (5) potentially exposed populations. If any one element is missing in a pathway, then the pathway is not complete. Then from the complete pathways, both current and future, rationales can be provided for which ones should be quantified. A site conceptual model, missing from the RI, should be included here and the pathway discussion should follow logically from it. Section 6.2.6 presents a conclusion that there was no significant risk of exposure under current conditions before the exposure assessment had been evaluated.

18. Page 116. Provide a reference for the communication with the Highland Park Manager. Can he/she document any type of human activities in the area? Is the Park Manager engaged in any occupational activities that might result in exposure?

19. Page 116. The rationales for absence of current exposures seem reasonable except for a statement made that indicates use of the intermediate aquifer for drinking water. Describe more fully where current populations get their drinking water.

20. Page 117. Discussions on potentially exposed populations should included the location (distance and direction) of a current or hypothesized future population relative to the site.

21. Page 118. Exposure is evaluated over three time periods: subchronic, chronic and lifetime. Each of these time periods has unique exposure point concentration associated with it. The risk assessment does not address (or even acknowledge) the distinction between these time periods. If subchronic, chronic and lifetime concentrations are assumed to be equivalent, the assumption must be discussed and a rationale provided. Likewise, the human activity inputs to the calculation of intakes may vary according to the time period being evaluated. There is no quantification of subchronic exposures and chronic exposures are assumed to be equal to lifetime. No rationales are provided.

22. Page 118. Include rationale for using the geometric mean in calculating exposure point concentrations. Superfund exposure assessments are based on a reasonable maximum exposure. Therefore, the upper bound of the mean (geometric or arithmetic) is the recommended concentration for use in the daily intake equation. Alternatively, if the upper bound results in an exposure point concentration that is higher than the maximum detected value, then the maximum detected value can be used.

23. Page 118. Section 6.2.10, first sentence. Without site specific data quantitative estimates of contact rates and exposure durations and frequencies are assumed.

24. Table 6.6. Indicate what samples were used in each exposure point calculation. Were nondetects ignored in exposure point calculations or were they included at their detection limits? Guidance recommends that nondetects (1) should not simply be eliminated from the exposure point concentration and (2) should be included at the U value or 1/2 the U value in exposure point concentrations (USEPA 1989b).

25. Table 6.7. The human activity inputs to the calculation for daily intake on this table are acceptable assumptions. Assuming 100% of the soil ingested daily comes from the contaminated area is probably overly conservative. The Chronic Daily Intake (CDI) for nickel should be 4.9E-5, not 4.9E-2. All other calculations for chronic daily intake are all overestimated by one order of magnitude.

26. Table 6-8. This residential scenario should be defined by a younger child since exposure via ingestion of soil is more significant in the subpopulation aged two to six. A two- to six-year-old child's assumed soil ingestion rate is 200 mg/day (USEPA 1989b); assumed body weight is 16 kg. The averaging time would then be 1,460 days (365 days/yr x 4 years).

The CDI for vinyl chloride would be 8.8E-7 using these inputs, not 4.48E-9 as on Table 6.8. All calculations on Table 6.8 must be revised.

27. Page 122. Table 6.9 missing. It is assumed that this table describes the calculation of CDIs from groundwater for both adults and children.

28. Table 6-10. This table needs major revisions.

- Cite a reference for the exposure time - the 2.5 hours does not agree with the text on page 126. Which is it?

- Add correct units to column headings: contact rate (L/hr), exposure time (hr/event), exposure frequency (events/year), exposure duration (years), body weight (kg) and averaging time (days).

- All CDI calculations are mathematically incorrect.

29. Why is the child resident not evaluated for a swimming scenario? In general, complete exposure pathways involving sensitive subpopulations (i.e., children) should be quantified.

30. For Table 6.11 the following revisions must be made.

- Add units to column headings.

- The estimate of exposed skin area during an exposure event is unreasonable. An outdoor "clothing" scenario, described in USEPA (1989a) suggests a typical exposed skin area of 0.2 m^2 (2,000 cm^2).

- The absorption factor of 1.0 is totally unrealistic. Metals are generally not absorbed across the skin. This is a pathway that is usually trivial, and of no practical significance because of this.

- Is there a site-specific justification for using a soil adherence factor for clay, rather than an average of clay and potting soil (2 mg/cm^2)?

- Document 80 days/year for exposure frequency. This does not correlate with description in text (Page 125).

- Why was this scenario not quantified for a child?

- All CDIs are mathematically incorrect.

31. Page 125. If the CDIs are summarized on tables, why are they repeated again in the text?

32. Page 128. At a minimum, each toxicity summary must at least describe the study used to derive the toxicity value, including critical effect, experimental animals, dose levels and dosing regimen.

33. Table 6.12. Agency for Toxic Substances and Disease Registry (ATSDR) does not derive reference doses in their Toxicological Profiles but Minimum Risk Levels (MRLs). These MRLs do not undergo regulatory review and no degree of confidence is assigned. The text introducing the toxicity assessment should mention this. Provide a footnote explaining uncertainty and modifying factors.

    The following revisions to this table must be made:

    - The oral Reference Dose (RfD) for copper is 4E-2 (USEPA 1989d) derived from the Maximum Contaminant Level (MCL).

    - The oral RfD for nickel is 2E-2 (USEPA 1990).

    - The oral RfD for lead has been withdrawn. The health effects of lead must be handled qualitatively - or described quantitatively using estimations of blood lead levels (PbB).

    - Remove silver - it was eliminated as a contaminant of concern.

    - The correct valence state for chromium is VI not IV.

34. Tables 6.13. Provide a footnote explaining the uncertainty and modifying factors. Correct typographical error on the last column heading (modifying not mobility).

    - The chronic RfD for 1,1,1-trichloroethane is 9E-2 (USEPA 1990)
    - Information missing from this table can be obtained from USEPA (1990) and (1989d).

35. Page 128. The toxicity summary for chromium should emphasize that the hexavalent form is the more toxic form of chromium and that most of the chromium detected at the site was not hexavalent. The third sentence is incorrect. Reduction of chromium does occur in the body. The third sentence on the top of page 131 must be revised to make sense. Is absorption from food 1%? Please clarify.

36. Page 131. The toxicity summary for copper needs editing to fix typographical errors and unclear, incomplete sentences. Mention that the oral RfD is derived from the MCL and not based on a toxicological study.

37. Page 132. The toxicity summary for nickel is inadequate. Oral exposures are not addressed.

38. Page 133. The toxicity summary for lead does not address the controversy in the scientific community regarding low levels of lead in the environment and the adverse effects especially to children and developing fetuses. Cite recent evidence that a PbB as low as 5 μg/dL may be unacceptable, and that the USEPA has identified a PbB of 10 to 15 μg/L as a range of concern.

39. Page 134. The toxicity summary for 1,1,1-trichloroethane does not address adverse effects after oral exposure. The toxicity value has been extrapolated from inhalation studies due to inadequate data.

40. Page 134. Describe the basis of the oral RfD for 1,2-dichloroethene.

41. Page 135. Sections 6.3.1 and 6.3.2 attempt to separate carcinogenic and noncarcinogenic health effects of the chemicals of concern. The descriptions, however, sometimes contain both. Reorganize this section on a chemical-by-chemical basis. Discuss noncarcinogenic effects first (in humans, then experimental animals, both oral and inhalation) then carcinogenic effects (in humans, then experimental animals, both oral and inhalation).

42. Table 6.14. The following revisions to this table must be made:

- Indicate these are <u>oral</u> slope factors.
- Vinyl chloride - correct to read 2.3E+0. The type of cancer should be liver.
- Remove silver - it was eliminated as a contaminant of concern.
- Define the weight-of-evidence classifications.

43. There is no toxicity summary for aluminum. It is not clear, however, whether it is or is not a chemical of potential concern. It is not mentioned on Page 113, but was included in CDI calculations for exposure to surface water (Table 6.10).

44. Page 136. Given the revisions necessary to respond to earlier review comments, it is inappropriate to comment on the risk estimates derived except to point out the following:

- The different aquifers are different pathways and as such each has their own Hazard Index (HI). An individual cannot ingest 2 L water from each aquifer every day.
- A random check of the values on Table 6-16 revealed incorrect calculations (e.g., zinc in swimming scenario). This calculation should be:

$$HQ = \frac{\text{CDI (from page 127)}}{\text{RfD (from Table 6.12)}}$$

$$= \frac{5.5E-8}{2.1E-1}$$

$$= 2.6E-7$$

The value on Table 6-16 is 5.5E-8. Table 6-16 is confusing and not well documented as to what each entry is. It appears that the authors do not understand the derivation of an HI. Values are incorrectly derived and inappropriately summed. The statement on Page 141 which mentions a "chronic hazard index score" for the site is evidence that HI values were not calculated on a population/pathway basis.

- The HQ calculation for dermal contact with soil used oral RfDs without an adjustment for absorption. The oral RfDs are administered doses.

45. Page 141. It is suggested that all inputs to the risk characterization undergo strict quality control checks before use in cleanup decisions. This includes not only mathematical accuracy but ensuring that the correct value has been used in the equation.

47. Tables 6.17 and 6-18. Delete these tables from the baseline report. They are more appropriately addressed in the FS.

4.0 SPECIFIC COMMENTS ON THE ENVIRONMENTAL RISK ASSESSMENT

1. Page 144. The bulk of the assessment is based on the 1984 Michigan Department of Natural Resources biological survey report. That report should have been used to develop assessment objectives, endpoints, data quality objectives and a strategy for additional data collection and not the basis of the entire assessment. At a minimum, the biological inventory should have been updated.

2. Page 144. No conceptual site model is provided for pathways involving environment populations.

3. Page 144. Much of this material is unreferenced.

4. Page 144. No evidence is provided of coordination with Federal and State Natural Resource trustees.

5. Page 145. Species of migratory waterfowl occurring in the vicinity of the site should be identified.

5. Page 145. State and Federal endangered and threatened species known or suspected to occur in the vicinity of the site should be identified.

7. Page 146. Section 6.5.5. Information on uptake of metals by plants should be provided from Kabata-Pendias and Pendias (1984).

   This reference provides data for plant species other than crops.

8. Page 145. Plants should have been sampled for metals contamination as part of site characterization.

9. Page 145. The status of the wetland relative to State use designation should be summarized.

10. Page 145. The Federal wetlands classification of the surface water bodies being assessed should be identified.

11. Page 148. More detailed information from the literature should be provided for the metals of concern at this site. The ATSDR Toxicological Profiles and USEPA's Integrated Risk Information Service (IRIS) are not designed to provide information on toxicity to nonmammalian species and are not a good source of this information. Information is available from other sources, e.g., USEPA ambient water quality criteria documents, the National Library of Medicine's Hazardous Substance Data Base (HSDB) or information from the U.S. Fish and Wildlife Service's (USFWS) ecotoxicological summaries.

12. Information should be provided on laboratory methods for hexavalent and trivalent chromium. Hexavalent chromium is generally considered the mobile form and trivalent the bound form. The fate and transport analysis for chromium should be expanded to address the possibility that hexavalent chromium is the form being transported in ground water to the target wetland, where it is reduced to the trivalent form and precipitated or adsorbed to organic materials in the wetland.

5.0 MISCELLANEOUS COMMENTS ON THE RI

1. The review of this document was made more difficult by the lack of a good site map that included all the identifying features of the site. A review of likely human activity patterns requires a sense of the relationships between areas and structures.

2. Appendices I through N give sampling results in an unsummarized format (units missing, data qualifiers not defined). This data has to be presented in a more readable format.

3. Pages 78 and 79 are missing from our copy of the report.

4. The RI report reads as a description of what was done and does not draw strong conclusions regarding the site.

6.0 REFERENCES

Kabata-Pendias A. and Pendias H. 1984. Trace elements in soils and plants. Boca Raton, FL: CRC Press, Inc.

Techna Corporation. 1990. Hi-Mill Manufacturing Company draft remedial investigation report and baseline risk assessment. Plymouth, MI: Techna Corporation, June 21, 1990.

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USEPA. 1989a. U.S. Environmental Protection Agency. Office of Health and Environmental Assessment. Exposure factors handbook. Washington, DC: U.S. Environmental Protection Agency. EPA/600/8-89/043.

USEPA. 1989b. U.S. Environmental Protection Agency. Office of Emergency and Remedial Response. Risk assessment guidance for Superfund. Volume I. Human health evaluation manual (Part A). Interim final. Washington, DC: U.S. Environmental Protection Agency. EPA/540/1-89/002.

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USEPA. 1989d. U.S. Environmental Protection Agency. Health effects assessment summary tables. Fourth quarter, FY 1989. Washington, DC: OERR 9200.6-303 (89-4).

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